The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XLVIII
No. 1250

SATURDAY, JUNE 12, 1943
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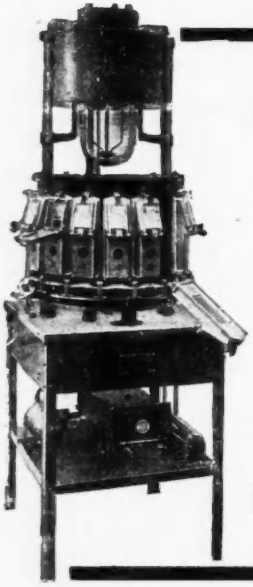

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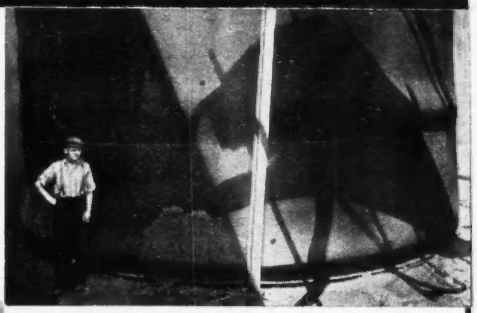

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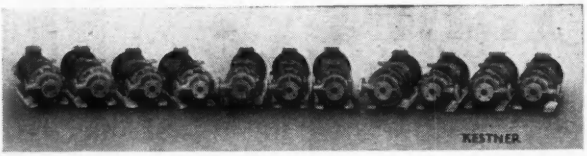

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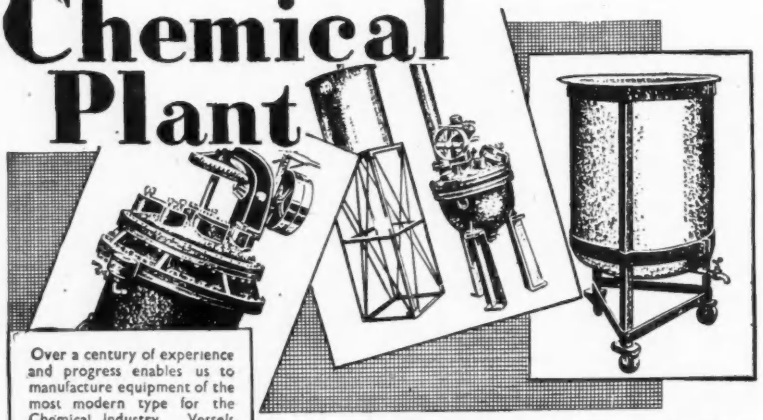

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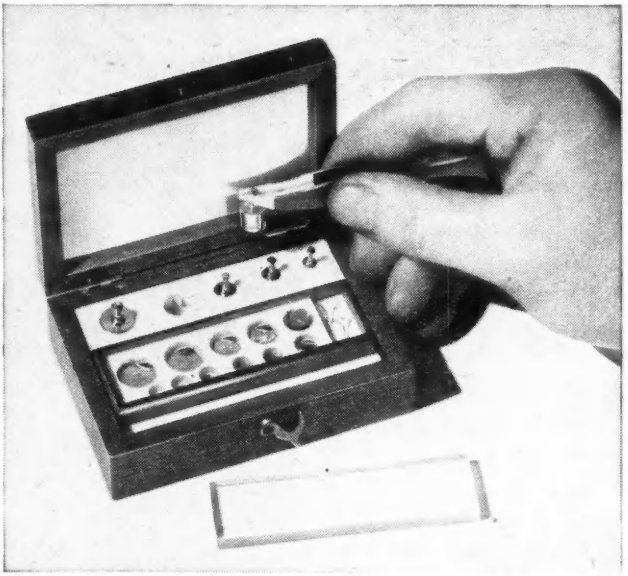

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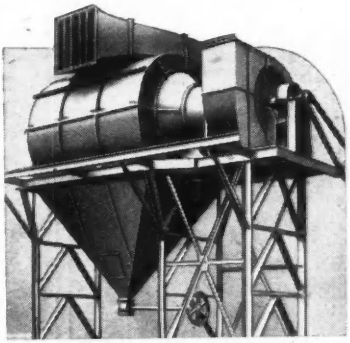

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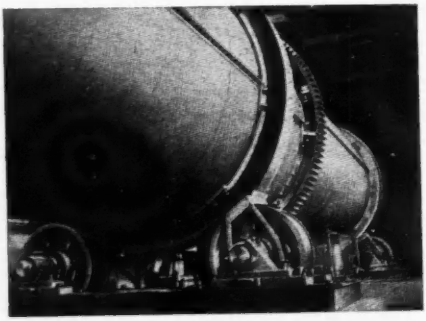

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VOL. XLVIII
No. 1250

June 12, 1943

Annual Subscription 21s.
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A Page of History

SOME day an interesting and thought-provoking book will be written on the influence of war on the development of civilisation. It is arguable that while wars bring to the generations that suffer them little but misery and ruin, yet in relation to human progress as a whole wars have had a beneficial effect. The problem is a nice one that we must leave to the scholars and philosophers to discuss, but it can certainly be shown from our own experience and from that of past ages that wars have stimulated industry and invention in a remarkable degree. It may be that the stimulation has been nothing more than a compression of events, a speeding-up of a process that would have come to fruition equally well, though a few decades later, had peace prevailed unbroken. Certainly, in our times war has greatly accelerated the industrial development of synthetic ammonia, flying, synthetic rubber, and petroleum refinery technique, to name but a few outstanding developments of our time.

Travelling back in history, we find (as shown by an analysis made by Dr. H. Schubert in a paper to the Iron and Steel Institute) that the English cast-iron industry was primarily due to the wars of the Tudors. The first cannon were made of non-ferrous metals, usually bronze, or of wrought iron, both of which were expensive. The shot were of cast iron. Cast-iron cannon were made exclusively on the Continent, though the shot was made here. Gunners of the days of Henry VII and Henry VIII were not only artillerymen, but also experts in the art of shot-moulding and of gun-founding. When Henry VII came to the throne in 1485 he kept in his service as gunners certain Frenchmen appointed by Richard III. There is no record what type of guns these people made. French artillery at that time had gained great fame and was predominant in Europe; this reputation dated from the reconquest of Normandy in 1449-50 by the perfected siege artillery of the brothers Bureau. These same makers' cannon aroused the admiration of the Italians during Charles VIII's expedition into Italy in 1494.

Fortunately, Henry VII was a monarch with a full understanding of the importance of artillery and he enlarged the number of his gunners considerably. By 1497 there were 49 gunners at the Tower. It is not surprising that the iron-founders of Sussex—the home of the British iron indus-

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try—were of French origin. By 1500, there were several ironworks operating in Ashdown Forest, but none of them made cannon, which were still brought from abroad. It took a long time for these early iron founders to become skilled enough to make so large a cast-iron article as a gun. Not until 1508 or 1509 is the first record found of English cannon. These were made by one Symart, a Frenchman who had been tenant of the King's iron mill near Newbridge in Ashdown Forest. The guns burst when being tried and Symart found himself imprisoned in the Fleet for his unsuccessful experiment. He was evidently of the true technical breed, not easily discouraged, for he tried again in 1509-10 and was this time successful, making 3 guns of 714 lb. each for the gun barrel and 425 lb. for the powder chamber. In the early years of Henry VIII guns were made in increasing numbers in Ashdown Forest and the Frenchmen were largely replaced by Englishmen.

Unfortunately, Henry VIII, having decided on a great expansion of the Navy, reversed his father's policy and brought his armament from abroad. As we shall see, there was a reason for this, but the nascent iron industry received a great set-back. However, foreign gun makers of repute were induced to settle and founded works in and around London. This was fortunate, because by the end of his reign Henry became so financially embarrassed that when in 1543 war with France became imminent and armaments had to be increased, there was need for guns of iron because of their lower cost. The parson of Buxted, William Levet, and his assistant, Ralph Hogge, stepped into the breach and made guns at their foundry at Buxted. Levet combined his Holy Office with that of "maker of iron stones for the Office of the Ordnance in the Tower," to which Hogge later succeeded. A Scottish invasion became threatening in 1545 and Levet was ordered to make 120 iron guns—these took 2 years. English works could still only make the smaller pieces weighing up to about 1400 lb. each. However in 1547 Levet, who was the overseer to the Duke of Norfolk's ironworks at Worth, built there a double furnace, consisting of a pair of furnaces side by side combined in a single structure. This rarity enabled siege cannon (culverins) weighing up to 4840 lb. to be cast. The English iron industry was now firmly established and began to get a reputation abroad. By 1567 Queen Elizabeth granted Hogge the monopoly of exporting "cast iron ordnance with gunstones." The British iron industry was established—purely out of the demand for munitions of war.

The hundred years following the Spanish Armada were the first of the two cardinal periods of British emigration overseas (just as the century between Waterloo and Gallipoli was the second). Although the early settlers started as farmers, it was their descendants who established the colossal industries of the United States, and laid the foundations for the growing manufacturing potential of the Dominions. Modern industries and manufactures need iron; so that to the same prime cause may be assigned the establishment of the iron industry overseas as well as at home.

This development of the iron industry was the real start of the industrial revolution. It was something of a false dawn, however. The expansion of the Navy under Henry VIII and Elizabeth required large quantities of wood for the construction of ships. Equally, the manufacture of iron necessitated the prior manufacture of charcoal. The competition for wood resulted in the purchase of iron abroad by the Governments of that day, a matter easily contrived, and the reservation of the wood for ship construction. Probably it was a sound decision, but during the next 100 years or so it brought the once prosperous iron industry down to very small proportions. Great efforts were made to find a substitute for charcoal and at last, in the eighteenth century, probably about 1709, Abraham Darby succeeded in making iron in a coke-fired blast furnace. Thus from the demands of the Army for cannon, by long years of effort, the coal carbonisation industry was established. This in the fullness of time gave rise to a great chemical industry, that of by-product coking, upon which were based coal-tar distillation and all its many ramifications. The roots of many branches of the chemical industry are set far back in history and it is sometimes a welcome relaxation from our struggles with an over-insistent present to pass backwards on the Wellsian time-clock and to trace the genesis of those processes which today have been brought to such a high pitch of perfection.

NOTES AND COMMENTS

Subscriptions and Income Tax

AN amendment to the Finance Bill tabled by Mr. H. N. Linstead, Viscount Hinchingbrooke, and Mr. R. Morgan, and concerned with deductions from the taxable income of scientists, has been debated in the House of Commons. The amendment suggested that amounts not exceeding £15 paid by any person as a subscription to an institution which (in the opinion of the Treasury) is conducted wholly or mainly for the advancement of any branch of learning, science or technology, might be deducted from that person's emoluments for taxation assessment purposes. Mr. Linstead pointed out the existing anomaly that while professional scientists assessed under Schedule D were entitled to deduct for Income Tax purposes any such subscriptions, scientist employees assessed under Schedule E were not so privileged, unless their employment was conditional upon their membership of such societies, and their employers were able to give a certificate to that effect. This, he claimed, weighed particularly heavy on young graduates receiving comparatively low salaries who would be the most likely to benefit from membership of the societies concerned.

A Distinction without a Difference

THE Attorney-General pointed out that it might be difficult to draw the line between allowable and non-allowable deductions; he cited as an example the decision of a learned judge who laid down that professional men could not be allowed to deduct the cost of taking in professional literature from their taxable income. He claimed that the real solution lay in ensuring that those who employ scientists should allot them salaries large enough to allow them to pay all the necessary subscriptions. It is obvious that difficulties of various kinds might arise, but the anomalous distinction between Schedule D and Schedule E cases still seems to have received no satisfactory explanation. The Attorney-General shelved the answer to a question by Sir H. Williams as to the position (from a taxation point of view) of a company which paid the subscriptions of its employees to scientific institutions. Mr. Linstead, in closing the debate by withdrawing the motion for the time being, noted that the Government spokesman had failed to explain why the difficulties that might arise if the concession were allowed to Schedule D taxpayers had never arisen in the case of Schedule E, and said "We shall have to plug away at this." There is obviously something to be put right, and we believe that if the amendment were phrased in such a way as to leave no loophole for sharp practice, the "chemical transformation of the Chancellor's heart" hoped for by Mr. Linstead might yet be achieved.

Education for Science

SIR LAWRENCE BRAGG and his committee have merited the heartfelt thanks of all industrial scientists for the report on the education and training of physicists which they have prepared for the Institute of Physics. The suggestions embodied in the report are equally applicable to the training of chemists, engineers, or any other type of technical worker. The report is far from being a destructive criticism; it does not seek to alter the features of existing courses merely to embody them in some uniform educational system. Its central theme is rather the necessity for a broad education which shall fit pupils both for co-operation in a team and for leadership in posts of high responsibility. A replacement of the present scholarship system by a modified system of State bursaries is, however, recommended. The spending of all three years of undergraduate study in one Honours School, to the virtual exclusion of other sciences, is considered to be undesirable specialisation, and a general course in science is recommended as the normal university prelude to an intensive study of a single scientific subject. The necessity to keep abreast of the rapid developments of the chosen subject, and especially of its applications in industry, is reflected in a recommendation that arrangements should be made for post-graduate courses both on the theoretical and experimental side.

The Place of the Technical College

AS we have so often insisted in these columns, an increased study of English language and literature is strongly urged in order that scientists may be able "to express themselves in clear, precise and attractive English." A knowledge of foreign languages is considered to be

important and to be a normal part of a research physicist's equipment. The report also stresses the important functions of the technical colleges in an industrial society, which, it maintains, must be kept distinct from those of the universities. The adoption of a State bursary scheme, whereby all those who show sufficient ability to profit by it, irrespective of their private means, will be able to receive a full-time university education, will, the committee hopes, enable the technical colleges to concentrate on their special activities by relieving them of the necessity of preparing students for external university degrees. Technical colleges should provide courses in branches of technology on the lines of those for National Certificates and Diplomas; students who take these should be enabled to obtain some recognised professional qualification. Wherever possible, it is recommended that the instruction should be given in the day-time. Many students of physics, as of other sciences, would benefit from some direct contact with industry as part of their training; the committee "think it inadvisable to prescribe which of the various possible methods is the best solution, as much depends on the character of the student and the facilities available." The importance of the study of the natural sciences in a well-balanced general education is stressed and a plea entered for presentation of physics to pupils through their natural interest in everyday objects.

A Vital Link in Industry

THE Post Office having at last emerged from the cloud of secrecy in which it has been enveloped since the outbreak of war, members of the Press have been summoned to visit and inspect parts of the London Trunk Telephone Exchange. A representative of THE CHEMICAL AGE took advantage of the invitation, and was suitably impressed by the vast and complicated organisation by which telephone subscribers throughout the country—and overseas—are linked up. In serious fact, the trunk telephone service is a vital link, not only in industry, but in ensuring that the insatiable demands of the Services are fulfilled. Some 3000 operators, mainly women, are engaged, night and day, in handling some 40,000 trunk calls daily—a figure that has increased about 33 per cent. since the outbreak of war and bids fair to go on increasing. The restriction of the length of ordinary trunk calls to six minutes has resulted in a satisfactory lessening of the number of calls "delayed," but we were informed that if every call could be shortened by only 30 seconds, about 500 hours per week would be saved and the "delayed" calls would practically disappear. The hospitality of the Post Office was not purely *ex gratia*; it is felt that the telephone girls have not been getting a fair share of the limelight that has been directed on to their sisters in the Services. An inflow of recruits of about 2000 per annum is required—part-time workers are welcomed—and it would be no more than just to say that the telephone service offers an opportunity to girls and women who are unable to join the services and are unsuited to factory life, to take a really important part in furthering the vital interests of their country.

Cadmium in War

WAR-TIME production figures for cadmium, when they come to be published, are likely to be interesting, as the uses of this metal for military and near-military purposes are both manifold and increasing. The largest consumer of cadmium is the electroplating industry, for it is invaluable as a protective for iron, forming, as it does, a rust-resistant alloy plating. The coating thus formed is very thin and adhesive, and does not peel off like zinc. It may also be used as a basis for plating with another metal. Cadmium alloy bearings, too, have proved superior in many ways to babbitt bearings. Cadmium-nickel alloys, and an alloy containing 97.5 per cent. cadmium, 2.25 per cent. silver, and 0.25 per cent. copper are outstanding against high temperatures and friction. Cadmium-bismuth alloys, on the other hand, are notable for their low melting-points and are used for fuses, fire-protection devices, etc., and for making small casts. Cadmium can be added to lead for cable casings, and is a substitute for tin in solders. The paint industry, photographic chemicals, rubber and soap products, and the ceramic and the dyeing industries are other fields in which this versatile metal is applied. Cadmium plating (for bolts, nuts, etc.) and cadmium bearings, both for military purposes, absorb the greater part of the world's production to-day.

Recent Developments in Analytical Chemistry—VI

(From Our Analytical Correspondent)

Cobalt and Nickel

SEVERAL processes for the determination of cobalt use colorimetric methods of estimation. Cobalt can be determined, even in the presence of large excess of manganese,[1] by forming the complex with α-nitroso-β-naphthol and extracting this with chloroform. The extract is then preferably measured photoelectrically, using a green filter. Cobalt has been thus determined when present as a trace in as much as 99.4 per cent. of manganese. The manganese may itself be estimated by precipitating it as the manganese ammonium phosphate, which is then converted to the formaldoxime complex. This is likewise determined photoelectrically, no filter being necessary.

Other workers, who have investigated various colorimetric methods for cobalt, prefer[2] to use ammoniacal ferricyanide as the reagent. In order to make the method convenient and as fool-proof as possible, they have adjusted the mode of operation so that all reagent solutions (with the exception of the coloured potassium ferricyanide solution) may be measured roughly without affecting the final intensity of colour obtained. The method as thus adapted is suitable for use with paint driers. To enable the method to be applied to steel analysis,[3] where a different set of conditions exists, oxalic acid is added before the routine precipitation of iron as hydroxide. In this way simultaneous precipitation of nickel and cobalt is prevented, and it is still possible to use the ammoniacal ferricyanide procedure for the cobalt. Nickel, too, may be estimated in the regular way with dimethyl glyoxime, before the cobalt estimation, and after the iron precipitation. Manganese, which is partly precipitated by ammonia, remains partly in the filtrate, and should first be removed. For a steel analysis, then, the routine is as follows: precipitate with sulphuretted hydrogen, leaving in solution cobalt, iron, nickel, manganese, chromium, aluminium, and zinc. The solution, on treatment with sodium peroxide, loses chromium, aluminium, and zinc, and the rest of the procedure is as outlined above. If it is desired to estimate iron, this should be done colorimetrically.

Nitroso-R salt (the sodium salt of 1-nitroso-2-hydroxynaphthalene-3 :6-disodium sulphonate) is also recommended for the colorimetric estimation of cobalt[4] since it gives a red colour in neutral or buffered solutions. Some other metals may also give colours, but these are destroyed by addition of nitric acid, and the solution is then buffered with sodium acetate, after which the colour is measured photoelectrically.

Gravimetric Methods

Alternatively, cobalt can be estimated gravimetrically[5] by the use of 5-bromoanthranilic acid. Anthranilic acid itself (2-aminobenzoic acid) has been used as a reagent for several metallic ions, of which the most usual are copper, cobalt, nickel, and zinc. The bromo compound apparently is quite as good a precipitant for these ions, and naturally it gives a better conversion factor. The author recommends the reagent particularly, however, for cobalt, since the cobalt salt may be dried and weighed without further treatment.

The coloured complex of nickel formed by treatment with ammonia has been investigated completely[6] with a view to determining the most satisfactory conditions for its use colorimetrically. The usual method was, after preliminary treatment, to precipitate the nickel first with dimethyl glyoxime, redissolving this precipitate before treating it for the colorimetric process.[7] This is now shown to be unnecessary (if cobalt and copper are absent), nickel being estimated directly in the solution after removal of the iron group. The blue-violet complex is stable for at least four weeks, so that it is quite feasible to prepare a set of standards which are semi-permanent. It is interesting to note that the author stresses that ammonia solution absorbs visible light, a fact not always fully realised; so that it is necessary to have the same concentration of ammonia in both standard and unknown.

Nitroso-R salt, mentioned above as a

reagent for cobalt, has also been applied to the microdetermination of iron.[8] The iron solution, at a *p*H of 8 to 10, is reduced to the ferrous state, using hydroxylamine sulphate as reducing agent. Nitroso-R salt produces with the ferrous iron a green complex which is a photoelectric or colorimetric measure of the iron content. Another reduction method for iron is useful in the presence of titanium,[9] and enables the latter also to be determined. When the solution is completely reduced, a permanganate titration gives the total iron and titanium equivalents. If another portion of the solution is then reduced and a little mercuric chloride solution added, air oxidation rapidly oxidises the titanium catalytically with very little effect on the ferrous iron. A titration of this solution with permanganate consequently gives the iron value, and titanium is then given by the difference between the two titres.

Modified Iron Determination

The electrolytic method for determining iron, though known for many years,[10] has never been completely satisfactory, since it was both slow and inaccurate. It is, however, true to say that an accurate electrolytic method would be preferable to a volumetric method, principally because, in general, the standard solutions for volumetric determination of iron (consisting as they do of oxidation-reduction reagents) do not store well. The original method for electrolytic estimation has therefore been modified[11] to allow complete deposition of the iron in a relatively short time. Using a ferric phosphate/sodium carbonate solution maintained at about 70° C., and a high current density, the iron is then deposited in less than two hours. Stirring of the solution is not necessary. The method allows up to 1 per cent. of manganese to be present without interference, but if nickel, molybdenum, or cobalt is present, any of these are deposited *in toto* at the same time as the iron.

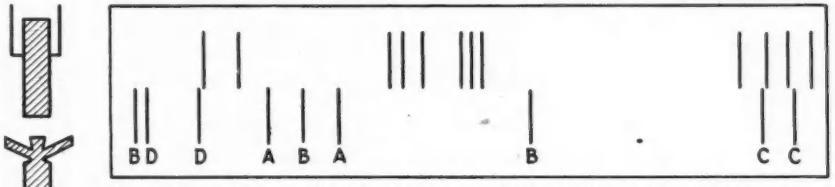
The estimation of the actual amount of *ferrous* iron in difficultly soluble substances is not simple, since most methods of solution will convert the ferrous iron more or less completely into the ferric form. An indirect method has been devised[12] by which the ore or other material is treated with a mixture of one part of sulphuric acid and four parts of phosphoric acid. The ferrous iron reacts to liberate either sulphur dioxide or a mixture of sulphur dioxide and phosphine. In either case the evolved gases are absorbed in standard dichromate; and whether only the single gas or the mixture is evolved, the equivalent of dichromate is the same. Determination of the excess of dichromate will then enable the original amount of ferrous iron to be derived.

Spectrographic Analysis

For the analysis of stainless steels, Hasler and Harvey[13] use a spectrographic method employing a direct current arc and carbon electrodes which are shaped as shown in Fig. 1. The steel is reduced to fine filings, and a 3 mg. portion is placed in the cup of the lower electrode, which acts as anode. A drop of alcohol is added to wet the carbon, and this is followed by a drop of sugar solution. The combined effect is to spread the steel filings evenly over the surface of the cup, and to fix them in place, on drying, by the cementing action of the sugar. There is thus no tendency for the molten metal to run together into a large bead when the arc is struck. For steels where the total constituents other than iron are as high as 45 per cent., nickel and chromium may be determined with an accuracy of ± 2 per cent., while silicon, manganese, niobium, and molybdenum are also included satisfactorily in the determination. The lines whose densities are determined are: chromium, 2879.3 A.U.; nickel, 2821.3, 3101.6 A.U.; manganese, 2933.1 A.U.; silicon, 2506.9 A.U.; niobium, 2950.9 A.U.; molybdenum, 2816.2 A.U. The iron lines used as standards are as follows: 2950.2, 2872.3, 2869.3, 2840.4, 2838.1, 2828.8 and 2804.5 A.U. To estimate traces of tungsten use is made of the fact that this element is carried down in the precipitate of alumina produced by adding sodium bicarbonate to the aluminium-containing solution.[14] If a series of standard arcs is prepared containing various amounts of tungsten thus co-precipitated with alumina, as little as 0.00002 per cent. of tungsten can be determined in an ore. The tungsten lines recommended for this purpose are at 2656.5, 2896.4 and 2947.0 A.U.

In order to deal effectively with small traces of metals such as copper, cobalt,

nickel, molybdenum, and zinc in plant and soil extracts, Scott and Mitchell have devised a useful concentration method leading up to a spectrographic analysis.[15] When an extracted solution



Top: Iron. Bottom: Mixture of Four Elements, A, B, C, and D.

Fig. 2. Chart of Sensitive Lines.

Fig. 1. Carbon Electrodes for Steel Analysis

of the material containing the inorganic constituents is brought to *p*H 5.2 and treated with 8-hydroxyquinoline, these elements, together with iron and aluminium, are precipitated quantitatively. This precipitate is collected and dried, subsequently being made up to a fixed amount with quartz powder. An aliquot portion of the resulting mixture is mixed with powdered carbon, and a direct current arc is struck at 3 amps., increased to 9 amps. with the electrodes 10 mm. apart, and burned for three minutes, using a logarithmic sector. From the spectrum obtained, the amounts of the trace elements relative to the iron content of the precipitate can be determined. The iron content is then found colorimetrically and from this value the relative quantities of the traces are converted to absolute values.

In an investigation of the spectrographic limit of identification of potassium, Norman and Johnson point out[16] that spectral sensitivity, while being highest for the alkali metals and alkaline earths, also depends on the technique used, the matrix in which the element is to be found, the anions present, and the strength of the lines used for the purpose. From their experiments they conclude that for qualitative analysis a direct current arc, with the lower electrode as cathode, is preferable in order to attain a high sensitivity. For potassium, use of the 7700 A.U. doublet (7664, 7698) is preferable to use of that at 4050 A.U. (4044, 4047), primarily because cyanogen bands interfere with the latter. In other words (allowing for the fact that the sensitivity varies according to the potassium compound used) the 4050 A.U. doublet will only permit 10 to 300 micrograms of potassium to be detected, but using the 7700 A.U. doublet the sensitivity is increased to such an extent that as little as 0.04 to 0.8 microgram of the element is shown.

It is generally assumed that it is possible by using emission spectrum methods to detect or determine only one of the halogens, and that one indirectly, by employing the band which fluorine gives in the presence of calcium. Johnson and Norman,[17] however, show that fluorine and iodine give satisfactory lines at 6856.0, 6902.5 and at 4785.5, 4816.7 A.U. respectively in the high voltage spark. The other two halogens give lines which are normally masked by the "air lines," but which can be utilised if the spark is run in an inert atmosphere of carbon dioxide (pure, as used in anæsthesia). The chlorine lines are at 4798.5, 4810.1 and 4819.5 A.U., while those for bromine lie at 4678.7 and 4704.9 A.U. It is thus possible to estimate halogens in inorganic materials with the high accuracy usually associated with the determination of metals spectroscopically.

For rapid and convenient examination of spectroscopic plates as employed for forensic work, *i.e.*, for the identification and rough quantitative comparison of constituents of small quantities of materials such as glass, paint, and alloys, simplification of the usual method of utilising comparison plates[18] has been devised. Strips of metal are painted

white, and on these are projected the contiguous spectra of an iron arc and a mixture of several known elements whose ultimate lines are known. The prominent iron lines and the ultimate lines of the mixture are then accurately marked on the white metal sheet, somewhat as shown in Fig. 2. It is then only necessary to photograph an unknown side by side with or overlapping an iron arc spectrum, and to project the finished plate on to the various metal sheets covering the range in question, to enable the sensitive lines of elements to be picked out. The inclusion of a number of sensitive lines for each element prevents any error due to near coincidence of lines, and it is possible to identify any of 40 elements in a material as complex as an alloy steel within fifteen minutes.

Absorption Spectra

When linoleic and linolenic acids are heated with a 1.4 solution of potassium hydroxide in ethylene glycol, an isomerisation takes place in which the acids are converted to compounds containing conjugated double bonds. This makes it possible to estimate these two acids in fats if no other acids with two or more double bonds are present.[19] The derivative from linolenic acid shows two absorption bands, one at 2680 and one at 2340 A.U. That from linoleic acid has a single band coincident with the 2340 band of linolenic acid. If, then, the absorption at 2340 A.U. is measured, an indication is obtained of the total amount of the two acids in the original fat. Measurement of the 2680 band gives the linolenic acid content only, and thus difference gives the figure for linoleic acid.

Absorption spectroscopy, this time in the infra-red, has also been applied with success to rubber analysis.[20] For identification of hydrocarbon mixtures the method is much preferable to such more usual methods as fractional distillation followed by determination of the boiling point, if only on account of the simple technique and the speed with which the spectroscopic method can be carried out. This renders it particularly suitable for control purposes. Under the present reference the spectra of hydrocarbons likely to be encountered, and of several synthetic rubbers, are illustrated. The method of analysis, the apparatus and its application to production control are described.

The determination of total sulphur in rubber and allied materials is usually carried out by oxidation, followed by estimation of the sulphate produced. The complete elimination of carbon black is difficult, so it is recommended[21] that a preliminary oxidation with nitric acid bromine should be followed by the addition of successive 0.5 g. portions of potassium chlorate to the *boiling* acid solution. Apparently there is no danger of explosion except where the acid solution is allowed to cool before addition of the chlorate. Sodium chlorate, which is easier to obtain in war time, may also be used, but is more likely to contain impurities.

Aids to Sulphur Estimation

It has been found that the addition of a small amount of agar-agar to the solution in which sulphate is being precipitated as barium sulphate is a great aid to the estimation.[22] Picric acid has previously been suggested for this purpose[23] since it alters the crystalline form of the barium sulphate, rendering it easier to filter. It is claimed that agar-agar is even more effective, presumably through some electrical effect with a colloidal origin. The sulphate is first precipitated in normal fashion in hot acid (HCl) solution by adding 5 per cent. barium chloride solution slowly. Following this, 0.5 to 1.0 ml. of an agar-agar solution containing 1 mg. per ml. is added drop by drop with stirring. At some point flocculation similar to that observed in an argentometric titration will occur, and the precipitate will settle rapidly. In addition, it loses its well-known tendency to creep. As a result, instead of requiring to stand overnight, the precipitate may be filtered after 30 minutes' digestion. The method has been checked against the routine method on coal analyses, and found to give equally accurate results.

Two electrical methods for sulphur as sulphate have been proposed. The first of these is derived from polarography[24] and is essentially an amperometric titration. The solution is titrated against standard lead nitrate solution in an inert atmosphere with a potential of 1.2 volts. The method has also been modified to enable it to be carried out in the presence of aluminium, although normally lead sulphate is soluble in aluminium nitrate solutions. This is overcome by adjust-

ment of the pH and addition of alcohol to the solution. The amperometric method is both rapid and accurate, even when only small amounts of sulphate are being determined. The other method enables nitric and sulphuric acids to be determined rapidly in the presence of each other, and takes the form of a conductometric titration.[25] The mixed acids are first made up accurately so as to have a total strength approximating to one-tenth normal. To 20 ml. of this solution in a graduated flask, N/10 barium hydroxide solution is added until the whole is neutral to phenolphthalein. Without filtration the whole is made up to 100 ml. If the conductivity of this solution is then determined at 20° C, it is found to be very close to that of pure barium nitrate solution, but it is preferable to relate the conductivity to the strength by a prepared graph.

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A New Oxine Technique

Determination of Magnesium in Aluminium Alloys

THE use of oxine (8-hydroxyquinoline) to precipitate metals is a well-established procedure; magnesium, aluminium, and zinc being frequently determined either by weighing the oxine complex or by bromometric titration of the precipitate. A disadvantage of the reagent is its non-specificity when several metals are present, but modifications of the technique offer useful analytical possibilities. (THE CHEMICAL AGE, 1941, *45*, p. 239). In a recent issue of *The Analyst* (1943, *68*, 806, p. 133), F. Pitts, of the British Aluminium Co., Ltd., research laboratories, describes a method of determining the magnesium content of aluminium alloys by oxine precipitation, which proves to be quicker than the phosphae process.

Details are given of a full-scale gravimetric method suitable for alloys not containing zinc, and of a modification enabling alloying quantities of zinc to be dealt with. A rapid, semi-micro volumetric method based on this modified procedure is also described. In absence of zinc, the bulk of the aluminium is removed by a caustic soda attack, copper and cadmium are precipitated as sulphides, and iron is oxidised to the tervalent state before precipitation of the magnesium by means of oxine from alkaline tartrate solution. A re-precipitation from the same medium and a final precipitation from ammoniacal solution with the same reagent effects complete separation from all other elements. In presence of zinc, the magnesium is precipitated from alkaline tartrate solution containing cyanide. Under these conditions, copper, cadmium, zinc and ferrous iron do not interfere and precipitation of sulphides is unnecessary. The presence of cyanide retards precipitation of magnesium, and vigorous stirring is necessary to make the precipitation quantitative. Re-precipitation is carried out as before, and then a final precipitation from ammoniacal solution.

This latter method forms the basis of a very rapid semi-micro method suitable for all normal alloys and involving only a single precipitation from alkaline-tartrate-cyanide medium, the smaller quantities of interfering elements and smaller excess of oxine rendering further precipitations unnecessary. The precipitated magnesium oxinate is redissolved and determined by the standard volumetric method with bromate. The accuracy is somewhat less than in the two previous methods, although it is sufficient for all control purposes. In all the methods a control determination is made simultaneously on a solution of known magnesium content

A fine of £200 was imposed at Liskeard County Court, on May 26, on Convoy Products, Ltd. (now in voluntary liquidation), of London, for supplying to a well-known wholesale grocery firm in Plymouth, "pure edible gelatine," which, according to the analyst's report, was nothing more than commercial glue, and contained four ingredients that were barred from edible gelatine, *viz.*: zinc, copper, lead, and arsenic. The proceedings had been adjourned since February because of the illness of the defendant's managing director, Mr. Levi.

Organic Chemicals in Brazil

New Manufacture in Full Operation

WHEN Brazil entered the war on the side of the United Nations she placed a wealth of raw material behind our war effort. The area of Brazil is only a little smaller than the whole of Europe, and her rich lands yield cotton, one of the most valuable of all war materials, rubber, coffee, and cacao. It is only comparatively recently, however, that the last two of these natural vegetable products have been processed locally on a commercial scale. The manufacture of "Cafelite" plastic from surplus coffee was described in THE CHEMICAL AGE in 1941 (*45*, 1163, p. 197); our illustrations to-day depict another modern Brazilian plant—the Organo Chimica factory, where the alkaloid drugs caffeine and theobromine are extracted from cacao in large quantities for use in medicine. (Fig. 1 below; Figs. 2, 3, 4, opposite.)

The principal alkaloid of the cocoa bean is theobromine, which chemically is 3 : 7-dimethyl-xanthine. It is found to the extent of 1-1.7 per cent. in the shelled beans, and 2.2-2.9 per cent. is present in dried fat-free cacao. The percentage in the commercially separated germ is about 2.0. Theobromine also occurs in the cacao shell, the quantity varying beween 0.2 and 3.0 per cent. During the fermentation process which forms part of the commercial practice the theobromine content of the nib (the "bean") decreases while that of the shell increases. Pure theobromine is a white crystalline powder, which is poisonous and has a bitter taste. It is used as a diuretic. As it does not dissolve easily in cold water it is generally administered in the form of the double compound of its sodium salt, combined with sodium salicylate, lactate, or acetate.

Caffeine, the alkaloid which occurs also in tea and coffee, is present in the cocoa bean to the extent of about 0.4 per cent.

Theobromine can be converted into caffeine quite easily, by the methylation of its silver compound. Caffeine, or 1 : 3 : 7-trimethyl-xanthine, differs from theobromine only in the fact that one of the hydrogen atoms of the theobromine is replaced by a methyl group. From water it crystallises in white silky needles, which have a slightly bitter taste. Its use as a cerebral and muscular stimulant is well known, and it is employed also as a diuretic.

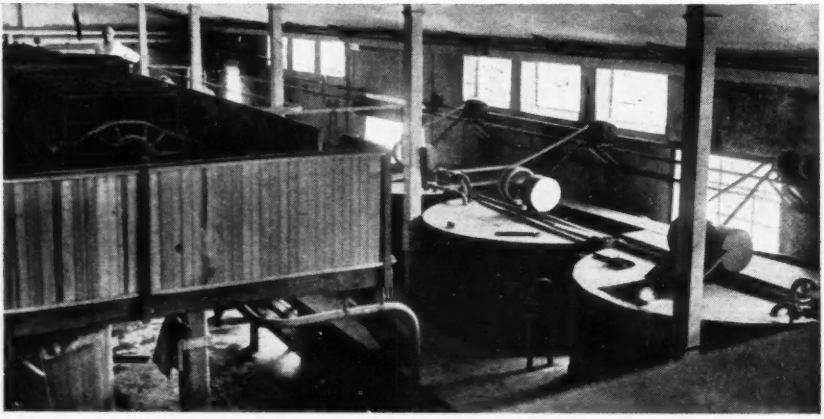


Fig. 1. A range of extractors.

American business men seeking solution of war-time technical problems now have at their disposal a unit of experts in Washington, it is announced by the War Production Board, whose job it is to answer their questions or refer them to the proper officials. The service is designed to eliminate confusion and delays on the part of those who want to know where to take their problems.

Representatives of the U.S. Board of Economic Warfare mission have visited the shale oilfields in New South Wales and are considering a detailed plan of operation. If their report is favourable, plant, equipment and technical assistance for the development of the shale deposits will be provided by America. It is expected that the shale at Glen Davis and Baerami will be exploited.

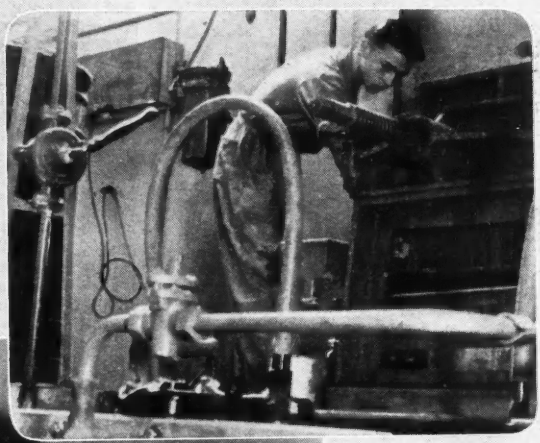


Fig. 2.—A machine in which the cacao beans are filter-pressed to obtain first extract.

Fig. 3.—Draining off cacao extract from a storage tank.

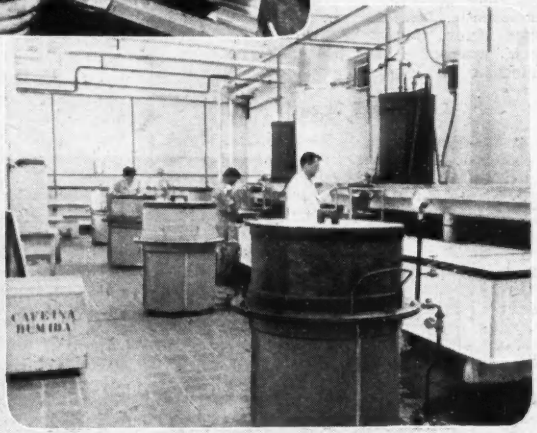


Fig. 4—A stage in the conversion of theobromine to caffeine.

Czech Chemical Industry

Joint Meeting with British Chemists

APPEALS for a closer contact, after the war, between the British and the Czechoslovak chemical industries were made by Mr. Gerald Druce, F.I.C., F.C.S., and Dr. George Lewi, F.C.S., at the recent meeting of the Association of Czechoslovak Scientists and Technicians in London, to which the main organisations of British chemistry and chemical industry were invited. Mr. Druce possesses a knowledge, unrivalled among his compatriots, of the Czech chemical industry; he holds a doctorate of the University of Prague; and he has regularly examined the progress of Czech chemical institutions since 1920. He reminded his audience of the tradition that the British sulphuric acid manufacture was originally acquired from Bohemia, where alums, vitriols, alkalis, and sulphur and phosphorus products have for centuries been produced in quantity, and he recalled the fact that since 1918 most of the world's supply of potassium permanganate had come from Ustí. Latterly, however, British industrialists have been apt to forget that there were 15 million inhabitants in Czechoslovakia who were potential consumers of their products.

To develop its chemical industry, said Mr. Druce, the Czech nation had need of able chemists and these were forthcoming through the universities and technical colleges; the reports of their research results make impressive reading, though they were consistently belittled by German chemists. Some of the distinguished Czech chemists were now eagerly working with us; others were still in danger at home. When they were once again free we should watch with sympathetic interest their efforts to reconstruct their industry. British chemists would appreciate the joint meeting as an indication of happy co-operation in the future.

Dr. Lewi's Speech

Dr. Lewi, chairman of the chemical group of the host association, in a brief but vivid sketch of his country's chemical industry, deplored the fact that chemical exports from Britain to Czechoslovakia were only 6 per cent. of the total, and imports thence into Britain only 5.2 per cent. (Germany 32.2 and 17.3 per cent.). Britain's share in the chemical trade was confined largely to explosives, and mutual exchange was limited to a few items, such as charcoal and wood distillation products, antimony, and carborundum. All pharmaceuticals and dyes (with a few exceptions), insecticides, solvents, paints, lacquers, rubber chemicals, and photographic chemicals, which were not made at home, were imported from Germany and France.

Though a few chemical factories had been inherited from Austria-Hungary, they had had to build up an industry producing thousands of new chemical products mainly as auxiliaries for their other great industries—their sugar, textile, glass, china, leather, and foodstuffs works—and for their extensive and modernised agriculture. Dr. Lewi recalled some of the outstanding achievements of his country's chemical industry—the birth of activated carbon at Ustí; the concentrated sulphuric acid of Kasnéjov (a 300-year-old industry); the development of the radio-active salts of Jáchymov; and the famous gold colours for ceramics. Also, in more modern times, the production of carbon black from coal-tar by-products, montan wax by extraction from lignite, and the high-grade output of heavy chemicals, notably sodium hypochlorite and hydrosulphite, and potassium permanganate.

"Vast German Arsenal"

Now the industrial potential of the "Protectorate of Bohemia and Moravia" had been turned into a vast German arsenal; it was subject to air attack and to sabotage from the Czech workers, and it would doubtless be destroyed by the Germans in their ultimate retreat. The basis on which it was built, however, cannot be destroyed, and he hoped that the meeting would help to supply the necessary impetus to the work of mutual understanding in the chemical world in preparation for the reconstruction of Europe.

Patent Rights

High Cost of Extension

PATENT rights were discussed at the last meeting of the Leeds Chamber of Commerce, when Mr. H. D. Leather said that after the last war an Act was passed extending the life of patents by two years. He was informed that provision had now been made whereby those who wished to apply for the extension of a patent, because of the war, could do so through the Courts. That meant a cost of £60 to £80 for each individual application, and it would be a serious matter for companies who held many patents.

"This seems to me to leave the question in an unsatisfactory position from the point of view of the holder of the patent who cannot work it during the war," he added. "Are we not going to have tremendous congestion and chaos in the courts? There may be in existence tens of thousands of workable patents."

It was decided to suggest to the Association of British Chambers of Commerce that patent rights should be extended by a minimum of two years or half the period that the war lasted.

LETTERS TO THE EDITOR

Petroleum and the Future

SIR,—In your editorial of May 22 you have stated that in view of the fact that the petroleum industry is doing nothing about supplying the chemical industry in this country with essential raw materials, this industry has to look more than ever to coal for their raw material. You are, of course, right in saying that the necessary raw materials for an expanding organic chemical industry are not forthcoming from Great Britain, because there is no petroleum refining (in the modern sense of the word) worth speaking of done in this country. Having for many years strongly advocated a large-scale home refining industry and having repeatedly stressed the importance of such an industry as a source of ample and cheap supply for many important raw materials for chemical synthesis, I may perhaps be permitted to add a few remarks on that subject.

The idea of using the by-products from petroleum refining (mainly the lower olefines and some aromatics) as starting materials for a large-scale chemical industry is very young indeed and only dates back eight or ten years. It is unfortunate that the oil policy of this country in general and the attitude towards refining in particular, has been governed by the Falmouth Report, issued February, 1938. This report considered refining entirely from the aspect of liquid fuel, as at the time it was drawn up the chemical industry based on oil was in its infancy and even 100-octane aviation spirit (*iso*-octane) was more a curiosity than a practical proposition.

Since then and especially during the war the petroleum industry in America has developed at an almost fabulous rate, and its enormous expansion has centred almost entirely around synthetic rubber, 100-octane fuel, and the production of chemicals from petroleum. It is very unfortunate indeed that, owing to war conditions and many other urgent problems on hand, it was not possible to revise the Government's outlook on petroleum refining in this country and to modify the finding of the Falmouth Report in the light of the developments in recent years. Looking back, it might have been well worth our while to do it in spite of the great strain laid on everybody by war conditions. These very unfortunate consequences of the Falmouth Report, however, do not mean that the petroleum industry in this country, or at least a part of it, is not fully aware of the absolute necessity of such a development at the earliest possible moment. The consumption of petrol, other liquid fuels and lubricating oil in this country is in the region of ten million tons per annum. While a small portion of our liquid fuels is being produced from coal the bulk is derived from crude oil. The production of our liquid fuel and lubricating oil requirements by means of petroleum refining in this country will give the chemical industry raw materials, at a cheap price, to the tune of 500,000 tons.

It is hoped, however, that the chemical industry will need much more raw material, mainly for the development of the new plastic industry with all its ramifications, for the production of artificial fibres and for many other purposes, the development of which has been tremendously speeded up during the war. There can therefore be no doubt that the production of large quantities of cheap raw material for the chemical industry from coal will be essential and will have to be developed at the earliest possible moment. It is hoped that the plans for such development will be ready as soon as this expansion is possible—when the stress of the war is lessened or gone. By raw materials for the chemical industry from coal I mean those based on by-products from coke and gas ovens, as well as those from low temperature carbonisation, the hydrogenation of coal and tar, from the Fischer-Tropsch process and, last but not least, from carbide. It is, in my opinion, a most essential task to lay down a programme stating which basic raw materials can be more cheaply, better, and more conveniently produced from either of these processes or from petroleum, in order to secure for five or ten years after the cessation of hostilities the maximum quantity of all these materials at minimum prices. There can be little doubt that the expansion of the organic chemical industry will also have its repercussions in the field of inorganic chemicals industry.

In view of your hard and not undeserved criticism of the petroleum industry, I should like to mention that in spite of all these obstacles the petroleum refining industry in this country has developed a range of products now known as Hibad (high boiling-point aromatic distillates), which as extenders for rubber, rubber-like plastics, and plastics for the manufacture of paint and many other chemicals, are of rapidly increasing importance in volume as well as in quality.

I am sorry that I am not able to agree with the line taken in your editorial, that the decision whether there should be ample and cheap supply of raw materials for the chemical industry forthcoming from a petroleum industry working on modern lines in this country should be left with the petroleum industry as a whole. I definitely think, as I have frequently stated during the last six or eight years, that this is not a matter for the consideration of individuals, companies, or even of an industry as a whole, but a matter of primary national importance, which must have far reaching consequences on the balance of foreign trade,

unemployment, and the standard of living in this country. I think it is only right to ask that the petroleum industry in this country be given a fair chance and that those who believe in a large-scale petroleum refining industry in this country be given a free hand and that those who are against such a development for whatever reasons should be prevented from interfering. I think that the chemical industry can render a tremendous service by relentlessly pressing to that end. I believe I am not wrong in predicting that as soon as such a state of affairs is reached the petroleum industry will deliver the goods, as it has delivered them everywhere during the last century, provided it was given a reasonable chance. You may then find that this progress will come more from the smaller and independent companies than from those who have large interests outside this country and have to co-ordinate many conflicting interests in their own house.—Yours faithfully,

F. KIND,
Managing Director, Manchester Oil Refinery, Ltd.

June 1, 1943.

"The Caravan Moves On"

SIR,—I should like to express my appreciation of your editorial in the issue of May 29. An increasing number of people, especially in technical circles, are gaining a real appreciation of the function of money and the influence of high finance. It is refreshing to see the subject dealt with in such an outspoken manner, and we feel sure that editorials of this sort will be well received by an ever-increasing number of technical readers.—Yours faithfully,

L. B. LAMBERT.

June 6, 1943.

Planning of Science

SIR,—Much is being talked and written at present about the planning of science, and your paper has twice recently dedicated an editorial to the subject. Planners regard freedom and planning of science as a unity, anti-planners as opposites. Which of them is right? As far as I can make out anti-planners regard science as separated from society, as the sole occupation of a privileged section—the scientists—in whom they apparently see a special creature, something out of the ordinary, and for proving it refer to the conditions 100 years ago when such an attitude was justified. They also distinguish sharply between pure and applied science. This attitude to science, followed by so many eminent scientists, surely needs careful attention.

In my opinion science has grown out of society and its findings are coming back to it in the form of practical applications. Nobody can deny that these applications have profoundly changed social life in civilised countries. Besides that, scientific findings have changed philosophical thought and influenced society that way.

The scientist is a normal human being and as a member of society distinguishes himself only by his scientific abilities. Few only are scientists by nature, the bulk being merely scientific workers whose abilities have developed through taking up scientific studies. But many have never had an opportunity to develop their abilities for scientific work, owing to the inequality of education and the insufficiency of scientific institutes. That is where planning ought to come in first: to secure the freedom of scientific education. Nobody would suggest that a modern state could be run without a plan. The same applies to science. Science has become a profession exercised by a large body of workers. The subjects of scientific work have become more and more diverse. This necessitates the careful co-operation of all scientific workers, nationally as well as internationally. For this purpose a plan is essential. Neither science nor scientists are free. Science is mostly directed to industrial ends with a view to profit and scientists are handicapped by overlapping, secrecy, jealous industrial as well as scientific competition, etc. Thus a central planning board could bring freedom to science and scientist alike.

Another matter is the direction of scientific research. In my opinion scientific research is rather one-sided at present, directed towards the physical and chemical sciences. The psychological, sociological, and biological sciences have been rather neglected and from this results a discrepancy in our knowledge, an accumulation of knowledge with regard to the undersanding of the Universe, but a lack of understanding of the relations of men to the Universe and to each other, which leads inevitably to clashes. A scientist's abilities are not for a specific science but can be directed to any science as the need arises without harming the freedom of research.

It seems to me as if the anti-planners have in mind to perpetuate the privileged position of a few, a privileged position which has not always been attained by high qualifications alone. Science must become the common good of the community and only planning can achieve this. The freedom of the scientist would not be impaired by planning; on the contrary he would become free to pursue his own aims as well as those necessary for society and science will get a chance of a new and unlimited progress for the benefit of mankind.—Yours faithfully,

E. KORNREICH, F.T.I.

May 31, 1943.

U.S. VANADIUM

Vanadium recovery from iron ore in Essex County, New York State, has been achieved as a result of U.S. Bureau of Mines experiments. The ore was used for the production of ilmenite, and the tailings from the mill were found to contain vanadium, with a high percentage of titanium oxide. The vanadium-bearing material, after sintering, was fed to a 6-ton experimental blast furnace and an average of 87.3 per cent. of the vanadium was recovered in the pig iron produced. By controlling the amount of titanium oxide in the slag of the furnace to about 10 per cent. the furnace was found to be operable without difficulty.

MARKING INK FOR GLASSWARE

For permanent writing on laboratory glassware, an effective and easily-compounded marking ink, of which glycerine is an important constituent, should find considerable application. The ink, green in colour, is made by mixing equal parts of chromic oxide and powdered lead borate. The powders are stirred into a mixture of equal parts of water, alcohol, and glycerine, the amount of liquid varying with the consistency desired. The ink is applied to the glass with a pen. When the ink is dry, the glass is warmed in the yellow flame of an adjusted Bunsen burner, then heated red in a blue flame. The glass is finally allowed to cool, using the yellow flame to lower the temperature slowly and prevent unequal stresses in the glass. This ink cannot be used on heavy, cast-glass equipment such as desiccators, battery jars, reagent bottles or the like.—*Ceramic Age*, March, 1943.

SCOTTISH LIME RESOURCES

The first research report of the Scottish Reconstruction Committee urges that Scottish limestones should be worked not only to bring thousands of acres back to fertility, but also for the post-war building programme and for chemical industries. Analyses made show that in all parts of Scotland limestone beds, containing 90 per cent. and more of calcium carbonate, are waiting to be worked. Instead of this we have the ludicrous spectacle of waggons of ground limestone that have travelled all the way from Derbyshire to sweeten the soils of Aberdeenshire, while there are enormous deposits of high grade limestone only 50 miles from Aberdeen, in a tract stretching from Tomintoul to Keith, Banffshire. The Committee has appealed to the Scottish Secretary of State to appoint scientific advisers to strengthen what is at the moment a hopelessly weak organisation.

DIAL THERMOMETERS

For general use in the chemical and other industries the glass and mercury thermometer has the disadvantage of being easily broken, and is also difficult to read and often inconvenient to use. Accordingly much interest attaches to the "heavy industrial" model dial thermometers made by the British Rototherm Co., Ltd., of London (Merton Abbey, S.W.19), which are available in three types, *i.e.*, co-axial, vertical, and flange. Like the other multi-helical bi-metal strip thermometers made by this firm, these have a metal stem and a metal dial with heavy glass front and chromium-plated bezel, like a small clock or pressure gauge, with the pointer moving over a graduated temperature scale that can be easily read from a considerable distance. Each model has three standard sizes of dial, 2½ in., 4 in., and 7 in. diameter, with stems of two standard diameters, ⅜ in. and 5/16 in. and of a length to suit the application. The co-axial design has the dial at right angles to the stem, while in the vertical design the dial is parallel with the stem. The flange model with co-axial dial is particularly suitable for ovens; for double-walled ovens, tanks, or other equipment, a gland is provided that makes a secondary joint with the inner wall and a main joint with the outer wall.

The temperature ranges on the "heavy industrial" dials are divided into two groups, with a series of graduations from 20°F. to 500°F., and a high temperature series for the 500-1000°F range. It may be mentioned that the co-axial model has the additional advantage that the small bi-metal multi-helical coil, the expansion or contraction of which registers the temperature, is coupled direct to the dial pointer without the necessity of using a gear-box. The most robust of the "heavy industrial" designs are those fitted with ⅜ in. diameter stems, but where greater sensitiveness is desired a 5/16 in. diameter stem should be used. These instruments are suitable for almost any gas or liquid up to temperatures as high as 1050°F.

LIQUID PECTIN

An inaccuracy has been pointed out to us by Messrs. H. P. Bulmer & Co., of Hereford, who are manufacturers of liquid pectin, in the statement which appeared on p. 539 in our issue of May 15, announcing that powdered pectin would be exclusively used by British jam manufacturers when existing stocks of liquid pectin had been exhausted. This statement refers only to liquid pectin imported from abroad; stocks of liquid pectin are still available from manufacturers in this country, and will continue to be, in accordance with manufacturers' capacity to produce.

Personal Notes

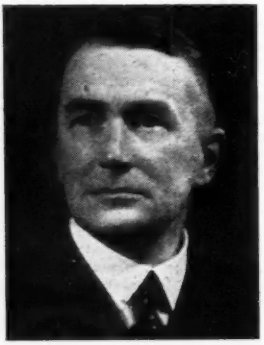
MR. E. W. B. OWEN, formerly of the John Bull Rubber Co., Ltd., is joining Rubber Improvements, Ltd., Willesden, as assistant chief chemist.

MR. LAWRENCE LEVY, who has been chairman of the board of directors of George Cohen, Sons & Co., Ltd., since 1928, has this week completed his fiftieth year of service with the firm.

MR. ROBERT BARLOW, chairman and managing director of the Metal Box Company, has joined the board of Baldwins, Ltd., makers of the tinplate used in metal box and can manufacture.

MR. S. A. GREGORY was elected chairman of the Graduates and Students' Section of the Institution of Chemical Engineers, at the annual meeting on May 28. MR. COLMAN GREEN was elected secretary, and MR. R. W. COVILL assistant secretary.

We publish this week a portrait of MR. L. P. O'BRIEN, F.C.I.S., whose election to the chairmanship of B. Laporte, Ltd., was announced in our columns last week. Mr. O'Brien joined the firm in 1924, after serving on the commercial staff of Joseph Crosfield and Sons, Ltd., Warrington. He was elected a director in 1925, and became vice-chairman two years ago. An ex-president of the Luton Chamber of Commerce, Mr. O'Brien is active as a Grand Councillor of the F.B.I., and as a member of Council and Group B chairman of the A.B.C.M.



Mr. L. P. O'Brien

At the annual meeting of the Institute of Gas Engineers, the Birmingham Medal for 1943 was presented to DR. E. W. SMITH, C.B.E., D.Sc., F.I.C., M.I.Chem.E., M.Inst.Gas E. The Silver and Bronze Medals of the Institution for 1942 were awarded to MR. J. CORRIGAN (Brighouse), and MR. H. N. DANN (Blackburn), respectively.

DR. ISAIAH BOWMAN, president of Johns Hopkins University, has been elected president of the American Association for the Advancement of Science in succession to DR. ARTHUR H. COMPTON, of the University of Chicago.

The final instalment of the Birthday Honours List includes the following awards: O.B.E., MR. E. R. SUTCLIFFE, chairman and managing director, Sutcliffe Speakman & Co., Ltd.; M.B.E., MR. E. S. ANDERSON, production manager, Northern Aluminium Co., Ltd.; MR. C. BALLIN, general manager, Liverpool Branch, United Molasses Co., Ltd.; MR. J. BAYLEY, stamp shop superintendent, High Duty Alloys, Ltd.; MR. P. W. WATERS, chief chemist and metallurgist, Ford Motor Co., Ltd.

DR. V. M. GOLDSCHMIDT, professor of mineralogy and geology at the University of Oslo since 1936, has been elected a foreign member of the Royal Society. The leader of important schools of geochemistry at Göttingen and Oslo, he has for many years devoted his attention to the discovery of the principles governing the terrestrial distribution of the elements. His researches into the crystal structure of ionic compounds may be regarded as having laid the foundation of the science of crystal chemistry.

New Control Orders

Naphtha and Xylol

The Minister of Fuel and Power has made the Control of Coal Tar Naphtha and Xylol Order, 1943 (S. R. & O. 1943, No. 768), which came into force on June 1. The Order is similar to the 1942 Order, which it supersedes. The main revisions are in part 2 of the Order (which deals with prices). Power has been taken to fix, by permit, a special increased or decreased price which substitutes the price specified in the permit for the applicable price specified in the Second Schedule to the Order. Prices, whether specified in the Schedule or in a permit, attract any applicable increases or deductions authorised or required by the provisions of the Order. Changes have been made in relation to the sale or supply of controlled products in small containers (Article 22), and the sale or supply of small quantities in containers holding less than one gallon have been excluded from price control (23).

Phosphate fertiliser plans in Switzerland have made some progress. The concentrating is to be done in an existing plant at Bussigny, and the grinding will be done at La Sarraz. Altogether, 200-250 persons are to be employed in this new Swiss industry.

General News—From Week to Week

The development of a special glue for use in producing newspaper photographs by process engraving is reported by the Eire Emergency Research Bureau. The product, made from fish-skins, is of a very thick consistency and is used for coating sensitised plates.

Notification to cease manufacturing soap has been issued to 27 firms, states Mr. Mabane, Parliamentary Secretary to the Food Ministry, in a written reply. Of those, only four have so far transferred production to essential factories.

Since the outbreak of war, the appropriate department of George Cohen, Sons and Co., Ltd. (states their house magazine "600"), has put into service 502 hydraulic presses, 279 hydraulic pumps, 110 hydraulic accumulators, and over 26 rolling mills of various types.

The price of rosin (per cwt. ex store), sold by the Ministry of Supply through their agents, the United Kingdom Naval Stores Association, Ltd., will be as follows until further notice: Gum rosin, grades F. to M., 40s., N/WG, 41s. 6d., WW, 43s.; wood rosin, grades B, 28s. 6d., FF, 34s. 6d., K, 38s.; Truline binder, 30s.; Vinsol, 30s.

The poor output of qualified people from our universities and technical colleges was mentioned last week by Sir Stafford Cripps to the Parliamentary and Scientific Committee. Government departments, he said, still found it difficult to get all the skilled personnel they needed now, and after the war there must be a much higher output if we were to have the right type of man in the various important industries on which we should depend.

Four graduates in chemistry are among the first ten Chinese students now on their way to Britain under a new scheme operated by the British Council. They have been given scholarships by the Council enabling them to work at the universities or colleges most suited to their special qualifications. The subjects in which the individual students will specialise during their stay in this country include chemical engineering, metallurgy, and pharmacy.

Sir Alfred Faulkner, in an address at Wolverhampton last week, urged the use of producer gas in place of imported petroleum fuel. He said that the Government producer gas had been proved to be good, and big motor vehicle manufacturers and operators had admitted that it gave better results than they thought possible. It might well be in operators' post-war interests to convert some vehicles to producer gas, for after the war the demand for petrol would be enormous, and the price high.

Dr. Elfed Thomas, director of education for Caernarvonshire, declared at a meeting last week that science is not given its proper place in adult education, for which greater use should be made of the laboratories and equipment to be found in the central and secondary schools.

The Ministry of Food has taken steps to control the speculation in essential oils which was having a damaging effect on war industry. Their importation, allocation, and prices will be controlled from July 1; in some cases prices will be reduced by as much as 80 per cent. Full details will be forthcoming later.

The Ministry of Fuel has published six new fuel efficiency bulletins. These are Nos. 11, Thermostatic Control for Hot Water and Steam; 12, Thermal Insulation of Buildings; 13, Fuel Economy by Saving Electricity; 14, Operation and Maintenance of Gas Burners; 15, The Effect of Variations in Output on Heat Consumption; and 16, Superheated Steam.

Deliveries of straw at paper mills have long been subject to a deduction of 20 per cent. because of the water content, and the farmers supplying the straw have been dissatisfied on the ground that the deduction was not made on a scientific basis. It has now been decided to allow papermakers' works chemists to assess the water content of the straw after making adequate tests and analyses.

The second list of Birthday Honours announces the conferment of the O.B.E on Mr. G. C. Bateman, Metal Controller, on Mr. G. R. Cotterelle, Oil Controller, and on Mr. J. R. Donald, Director-General, Chemical and Explosives Production Branch, all of the Canadian Department of Munitions and Supply. Five Canadian scientists receive the O.B.E. and 12 the M.B.E., "for valuable public service in scientific research."

Foreign News

Expansion of manganese production and the search for pyrites in Chile are being encouraged. The Corporación de Fomento has made a grant of 300,000 pesos for exploiting pyrites deposits in Atacama; a grant of 1,000,000 pesos to the Sociedad Minera La Coruña is for manganese ore production.

Decay during the drying of green timber is retarded by the use of urea, according to laboratory investigations by F. H. Kaufert and E. A. Behr, of the University of Minnesota, U.S.A. For chemical seasoning the use of from 40 to 100 lb. of urea per 1000 board feet is recommended, the amount depending on the type and dimensions of the wood.

The New Zealand Government has issued a paint control order, imposing strict regulation of the import, production, sale, and use of paint and its ingredients. A licence is required before such materials as phthalic anhydride, amyl acetate, chromium oxide, and zinc oxide can be used in paint manufacture.

Production of chemicals and allied products in Canada reached a total value of $304,400,000 in 1941 on the basis of final figures, compared with $193,900,000 in 1940, according to the Dominion Bureau of Statistics. Gains were principallly in heavy chemicals (62 per cent.), and in the explosives and shell-filling (168 per cent.).

Contracts between the Government of New Zealand and a local firm have been completed for the systematic collection and treatment of agar seaweed. The initial equipment installed will treat 1 ton of seaweed weekly; other units will be added as greater supplies become available. The N.Z. agar is stated to be superior to the Japanese product.

Control of potash in America, to counteract the tendency of consumers who overbuy, is envisaged by the War Production Board. In the potash industry it is believed the contemplated regulation might take the form of a guide to those engaged in distributing potash rather than an outright allocation order, and this would serve to supplement the existing order controlling supplies of artificial fertilisers.

The Eighth Army has a mobile laboratory for testing petrol captured from the Axis armies. Major D. G. Pidgeon, a petroleum chemist in civilian life, commands this unit. Much of the enemy stock is found suitable for immediate use, while other samples can be converted into a serviceable mixture by blending. Little is wasted, as polluted petrol which is valueless for engines is used in cooking stoves.

Experts are now satisfied, states *The Times'* Melbourne correspondent, that aluminium can be manufactured from Australian bauxite, and have recommended that an industry be immediately established at a cost of several million pounds. Shipping space, however, may preclude the import of the necessary treating plant, which would make a greater demand upon it than the ingots now imported for the rolling mills.

The Tasmanian Government is seeking a grant of £1,500,000 from the Commonwealth to exploit bauxite deposits. Reliable estimates indicate that 4000 tons of urgently needed aluminium could be obtained in Tasmania by this expenditure. The Premier, Mr. Cosgrove, suggests that the Loan Council should be asked to approve an initial grant of £200,000, which would be sufficient to establish a pilot plant capable of producing about 3 cwt. a day.

The Barbados House of Assembly has passed a resolution voting £1500 for the experimental manufacture of synthetic charcoal. The material used will be bagasse (the residue of sugar-cane after the sugar has been extracted), and vacuum pan molasses. It is estimated that this charcoal can be produced for less than £5 a ton.

The Finnish company, J. W. Enqvist O/Y, is building a food yeast factory in connection with its sulphite plant at Lielathi, near Tammerfors, using the sugar products from the sulphite in accordance with methods developed in Germany. The factory, which will have a capacity of 1,000,000 kg. of dry yeast, should start operation this autumn.

Extensive low-grade phosphate deposits have been discovered in the Clarendon district of New Zealand. A preliminary survey reveals the probability of large areas of easily worked material, which might make good the deficiencies caused by the loss of Nauru and Ocean Islands, formerly the source of the Dominion's phosphate.

Staffing the synthetic rubber industry in America is a particularly difficult problem, states the U.S. Employment Service, because no already existing supply of labour can easily be drawn upon without further training. Present estimates are that 20,000 workers will be needed, and their recruitment and training is being planned by the War Manpower Commission in co-operation with officials of this new industry.

Forthcoming Events

The Institute of Chemistry (London and and S.E. Counties section) will hold a meeting, at 6 p.m., on **June 16,** at 30 Russell Square, W.C.1, when Dr. W. T. J. Morgan, F.I.C., of the Lister Institute, will lecture on "Some Recent Advances in Immuno-Chemistry."

The next meeting of the London branch of the **Electrodepositors' Technical Society** takes place at the Northampton Polytechnic, London, E.C.1, on **June 21,** at 5.30 p.m., when a paper will be presented on "Some Applications of Chromium Plating in Ordnance Manufacture," by Dr. David D. Howat, F.I.C., A.M.I.Chem.E.

The British Coal Utilisation Research Association has arranged a conference on the ultra-fine structure of coals and cokes, to be held at the Royal Institution, Albemarle Street, London, W.1, on **June 24** and **25.** The conference will be opened at 10.30 a.m. on the first day, and a disucssion on "Colloid Properties" will take place at 2.30 in the afternoon. At 10 a.m. on June 25 there will be a discussion on "X-Ray Diffraction Investigations," and another on "Physical Properties," at 2.30 p.m.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BRITISH CELANESE LTD., Torquay. (M., 12/6/43.) May 19, £14,000 debenture stock, part of an amount already registered. *£3,108,761. February 3, 1943.

Satisfaction

BRITISH OIL & CAKE MILLS, LTD., Port Sunlight. (M.S., 12/6/43.) Satisfaction, May 19, of trust deed and supplemental charges registered December 11, 1901, outstanding July 1, 1908, November 25, 1912, January 4 and July 26, 1917, July 26, 1918, and July 31, 1935, in full.

Company News

Cerebos, Ltd., have declared a final dividend of 30 per cent., making 40 per cent. (same).

Carlton Chemical Company, Ltd., have increased their nominal capital by the addition of £250, in £1 ordinary shares, beyond the registered capital of £100.

William Butler and Co. (Bristol), Ltd., announce a net profit of £18,610 (£29,762), and a final dividend of 4 per cent., making 6½ per cent. (7½ per cent.).

A final dividend of 4 per cent. on the ordinary shares of **Boots Pure Drug Co., Ltd.**, brings the total payment up to 24 per cent. (same). The net profit for the year to March 31, 1943, is £643,345 (£622,784).

A final dividend of 10 per cent. is to be paid on the ordinary shares of the **Cape Asbestos Co.**, making a total for the year ended December 31, 1942, of 12½ per cent. (the same as for 1941). Profits for the year were £169,209 (£93,521).

The full accounts of the **Electrolytic Zinc Co. of Australasia, Ltd.** (whose preliminary statement was published in our columns on December 26 last), have now been received. The ordinary dividend for the year ended June 30, 1942, was 9 per cent. (14 per cent.), and the net profit £303,916 (£362,784).

New Companies Registered

William McNab, Ltd. (22,392).—Private company registered in Edinburgh. Capital: £500 in £1 shares. Sheet-metal workers in all metals and their alloys, engineers, etc. Directors: W. B. Semple, 5 Glamis Avenue, Newton Mearns, Renfrewshire; and J. G. Hamilton.

Frank H. Lambert, Ltd. (380,567).—Private company. Capital: £1000 in 1000 shares of £1 each. Consultants, specialists, manufacturers and merchants in plastic materials, chemists, etc. Directors: F. H. Lambert and Lilian E. Lambert. Registered office: Kent House, 87 Regent Street, W.1.

Metropolitan Chemicals (Kingston), Ltd. (380,626).—Private company. Capital: £300 in 300 shares of £1 each. Colliery, mine and quarry owners, manufacturers of coal by-products, manufacturers of and dealers in tar, tar distillates and residual products, etc. Subscribers: Lottie Moorhouse; A. Tame. Solicitors: Parsons, Evans and Francis, 13 George Street, W.1.

Lustrac Plastics, Ltd. (380,478).—Private company. Capital: £1000 in 1000 shares of £1 each. Manufacturers and dealers in plastics, moulding materials, chemical substances and products, etc. Directors: E. R. S. Holloway, 26 Crescent East, Hadley Wood, Herts.; A. A. Clark; G. G. Small. Solicitors: Cartwright, Cunningham and Co., E.C.2.

Peter Markham (Chemicals), Ltd. (380,666).—Private company. Capital: £2000 in 2000 shares of £1 each. Manufacturers of and wholesale and retail dealers in chemical goods and products, dyes, pigments, fertilisers, plastics, oil, grease, soap, etc. Directors: P. J. Markham and Effie O. M. Markham. Registered office: 82 Victoria Street, S.W.1.

Chemical and Allied Stocks and Shares

STOCK Exchange markets showed slight improvement in activity, but with few exceptions, movements on balance were again very moderate. Imperial Chemical at 38s. 6d. were virtually the same as a week ago; the 7 per cent. preference units eased to 34s. 1½d. Turner & Newall showed steadiness at 76s. awaiting the interim dividend announcement. Elsewhere, the units of the Distillers Co. were firmer at 85s. 3d. in response to market confidence that the forthcoming announcement is likely to show maintenance of the dividend at 16¼ per cent. On the other hand, Barry & Staines had an easier appearance at 40s. 6d. awaiting the preliminary statement for the past financial year. Boots Drug 5s. ordinary showed a firm tendency at 40s. 10½d. xd. on the increased profits; as was expected, the dividend is maintained at 24 per cent. for the third successive year. There was a better trend in Dunlop Rubber which rallied to 36s. in response to the strong balance sheet and the chairman's statement that a

temporary solution of the rubber position should come nearer through the increase of synthetic supplies from America.

B. Laporte remained firm at 78s. on further consideration of the financial results. There was, however, a small decline to 49s. 3d. in British Aluminium, but pending the dividend announcement, British Plaster Board at 27s. 9d. have shown a moderate rally. Associated Cement were 56s. 6d. Following recent declines, the tendency in iron and steel securities appeared to be steadier. After moving down to 33s. 3d. Guest Keen improved to 33s. 6d.; Babcock & Wilcox rallied to 48s. Stewarts & Lloyds were 50s. 6d., and Tube Investments 92s. 6d., United Steel 26s. 6d., and Dorman Long 27s. 4½d. Elsewhere W. J. Bush kept their recent rise to 53s. 9d. and remained firmly held. Business around 48s. was recorded in Fisons ordinary, and Burt Boulton were 19s. Pending the financial results, Morgan Crucible preference issues remained firmly held; the 5 per cent. second preference changed hands at 23s. 9d. at one time. Among smaller-priced shares, Greeff-Chemicals 5s. ordinary were 7s. 3d. British Glues 4s. ordinary (7s. 10½d.) were firm and inclined to move higher pending publication of the financial results.

British Industrial Plastics 2s. shares were again 5s. 10½d., Erinoid 11s. 6d., and Lacrinoid Products 4s. 4½d. Awaiting the financial results, Thomas De La Rue were firm at £5⅜. Borax Consolidated were steady at 34s. 3d., General Refractories 15s. 4½d., and Imperial Smelting remained at 14s. 4½d. Following their recent decline, Allied Ironfounders had a steadier appearance at 47s. 9d. Wall Paper Manufacturers deferred units at 37s. were 3d. better on balance. Whereas Lever & Unilever remained at the lower level of 34s. recorded a week ago, Lever N.V. showed further improvement on balance from 32s. 3d. to 33s. Pending the dividend, Metal Box shares remained firm and were quoted at 90s. Cellon 5s. shares continued to hold their recent rise to 22s. 6d., and after an earlier small decline, United Molasses made a partial rally to 28s. 10½d. Only small movements were shown in textile securities, including British Celanese and Courtaulds, which are 21s. 6d. and 49s. 3d. respectively at the time of writing.

British Drug Houses remained at 20s.; the company reports record sales in the past year, but taxation bears very heavily on the company; no less than £295,311 has been provided in this connection during the year. Nevertheless, net profits at £30,091 compare with £23,402 in 1941, and as previously announced, the dividend is again limited to 2 per cent., which permits £10,000 to be added to reserve, leaving the carry-forward little changed at £17,936. Elsewhere, Sangers were quoted at 20s. 4½d., and Timothy Whites at 28s. 1½d. Among oil shares, Burmah Oil and Anglo-Iranian improved; "Shell" have shown a firmer tendency at the time of writing.

British Chemical Prices

Market Reports

CONDITIONS in most sections of the chemical market are steady and the movement of supplies against contracts continues satisfactorily. Fresh buying interest has been on a moderate scale and throughout the market prices remain firm. Among the soda compounds industrial refined nitrate of soda is moving into consumption in good quantities while the solid grades of caustic soda are receiving a fair inquiry. Offers of yellow prussiate of soda are still restricted, with values covering a fairly wide range. Glauber salt, salt cake, soda ash, and bicarbonate of soda are very firm, and the pressure for contract deliveries is sustained. In the potash section the dominant features are the tight supply position and strong prices. Among the miscellaneous chemicals such materials as sulphur, calcium carbide, crude and refined glycerine, and arsenic are attracting plenty of attention, while formaldehyde is meeting with a good demand and makers are well sold. In the market for coal-tar products the pressure for contract deliveries is the chief feature.

MANCHESTER.—Although undoubtedly firm in all sections, the Manchester chemical market has shown little actual change in prices during the past week. There has been a fair amount of inquiry in circulation and this has resulted in a moderate weight of new business. In most branches, however, makers are already well booked and contracts are being drawn against steadily, especially in the alkalis, in the ammonia and magnesia products, and in the heavy acids. Compared with recent weeks there has been little alteration in the general position of the tar products. The price position is strong in virtually all sections and most classes of material, both light and heavy, are finding ready outlets.

GLASGOW.—There is no actual change in the position in the Scottish heavy chemical trade during the past week. Home business remains steady. Export trade is still rather restricted. Prices remain very firm.

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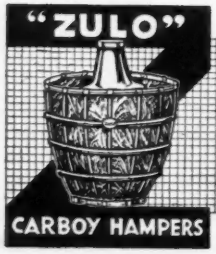

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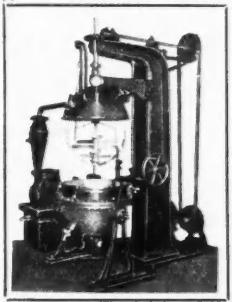

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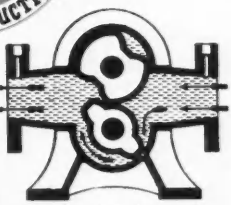

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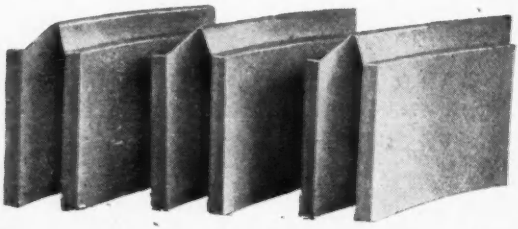

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Printed in Great Britain by THE PRESS AT COOMBELANDS., London and Addlestone, and published by BENN BROTHERS, LTD., at Bouverie House, 154, Fleet Street, E.C.4., June 12th, 1943. Entered as Second Class Matter at the New York, U.S.A., Post Office.